SOME IDEAS ON THE POSSIBLE PERCEPTION OF MUSICAL STRUCTURES[22]

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ABSTRACT

Starting point of my thoughts is the question what exactly (as far as it is possible to find out by thinking over it) happens in the ear, respectively in the brain, while listening to music, in the sense of the processing of the acoustic information. Connected to how this processing of information works is the question how music can be made up to provide the acoustic perceptive apparatus with stimulation and food which are usable for it, that is to say, from which the listener can derive the sense of what the composer tries to tell him. Those are fundamental thoughts, applied also to musical examples, which are important for me to keep in mind when I am composing.

Keywords: listening to music, information, levels of perception, sense, phrase-feeling

Starting point of my thoughts is the question: what exactly (as far as one can find out by thinking over it) happens in the ear, respectively in the brain, while listening to music? I am not talking about the emotional sense, but the sense of the assimilation of the acoustic information, the data-processing. How far is music able to stimulate the apparatus of perception? An important question arising here is: how does this perceptive apparatus actually work? And further: what prerequisites can music fulfill in order to give stimulation and food to this perceptive apparatus?

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Example 1:

For instance, what happens while listening to this simple melody of a children's song (ex. 1)? The ear perceives – and the brain realizes at the same time – that the first tones follow each other within the same distance of time, that there is a stop at the highest note (twice as long as the notes before), that this highest note is repeated, that later on (in the 4th bar) there is a come back to this note, that the time-distances in the 3rd bar are the same as in the 1st, that the 2nd and the 4th bar are as long as the 1st one, although there are different amounts of notes in each of those bars, that the bars 5-8 have the same rhythm as 1-4 (except for the little variation in b. 8, which is taken back in b. 12), that the notes of the 1st and 2nd bar are comprehensively - and in inverse order - presented again, that the last pitch is the same as the first one, etc.

Although not every listener will be able to tell all this in words, he perceives it exactly in this way: The brain connects what it perceives in one moment, with what it heard just before. The brain is trained to this way of perception and conjunction, because it is necessary for surviving. Without this ability to connect something present to something past we could not find our way in the world, we could not plan things, realize danger, and we could not experience music, not even the simplest sequence of notes, because we could not find a relationship between them. The brain is trained to perceive sounds: the baby engraves the sound of the mother's voice in its memory, which is good for its surviving, because it has to recognize the mother, in order not to entrust itself without reserves to a foreign person. Equally important is the ability to distinguish between high pitch and low pitch: The first man in the savannah distinguished the sounds of animals this way. A low and loud sound indicates a big animal, also the length tells something about the size of the animal, the volume tells in addition to this also something about the distance to the animal. High, low, long, short, loud, soft: essential parameters in music as well.

This seems to be one of the main aspects: to arrange tones / sounds (and all sorts of impressions, of course) in what we have already experienced and to put it in relation to that. This means for the listener to create this relation in his head, and for the composer, to put on paper relations of notes / sounds in such a way, that the listener has the chance to recognize

those relations. Experience shows that relations based on serial structures, for instance, are not recognized by most of the listeners (which does not mean that there cannot be good serial pieces of music). What is the reason for this? Why do serial structures not fit to our perceptive apparatus and to our ability to recognize? Are they too complicated for us? A friend told me: "On the contrary, they are too simple for us." He means, too simple because they offer relations within only one level, even if there are various parametres (for instance pitch and duration) involved.

He might be right, if we consider that it is natural for us and essential for our surviving that we assimilate impressions on several levels simultaneously: We hear the barking of a dog, and immediately we have in mind the picture of a dog and connect various experiences and feelings with it. Or we walk through the city, cross a street and hear close to us the loud noise of a car's brakes, accompanied by a honk: Immediately we make a reflex-like move to get to safety, exactly as the first man did in the savanna, when he heard the noise of a possibly dangerous animal. Perception and the assimilation of it always take place on different levels at the same time, an acoustic stimulus causes an optic image and a motor reaction, an optic impression (like the view of a cake) may cause a physiological reaction and be the reason for desire etc.

Obviously this connecting of levels, this reference of an experience to a background is relevant to the apprehension of music: If I play in C major the beginning of Mozart's *Sonata Facile*, playing in the 1st bar in the right hand an e-flat instead of the e-natural (ex. 2), you will experience this e-flat to be a remarkable note, even a "wrong" one, although it is not dissonant.

Example 2:

The C major key, which is already established within the first few notes, gives a specific meaning to all notes. If I did not have C major in mind, it would not matter for me if I played an e-flat or e-natural here. The same with the rhythm: If I play in the middle of the 2nd bar the c" in the right hand one quaver later, the ear will register immediately that this note comes later than expected, after the beat, "too late". If there were no meter already fixed at this moment (4/4), I would not at all mind if this note came one eighth note (that is about 0.2

sec.) later or sooner. It is as if I took two crayons, a red one, 17 cm long, and a blue one, 18 cm long. If I look at them one after the other, I will hardly be able to tell which one is longer. If I put them one besides the other, I will immediately see the difference. The exact processing of a perception, the measuring, happens by comparing. The sounding pitches are compared to each other not only within one single level (higher / lower), but in addition to this they are engaged in a relationship to the background offered by the key (fitting / conflicting), just like the durations of the notes are not only related to each other (longer / shorter), but are also heard in relation to the meter (on beat / off beat).

This does not at all mean that music, to be good, has to be tonal and metric, there exist good atonal and ametric pieces of music, too. But certainly tonality and metrics are successful in offering the possibility to the ear and the brain to use and train their inborn and acquired abilities. Thus our mind is stimulated and, in the best case, also pleased. Music works as training for the ear / the spirit, like sports do for the body. This training usually feels good, because it strengthens our ability to survive.

Tonality and metrics have the effect of a foil or a background, a measuring cord which creates an expectation, whereby there grows a musical arch: An arch from the wakening of an expectation to its fulfillment or surprising non-fulfillment. This arch starts with an acoustic impulse, an acoustic stimulation, which catches our attention, brings up a question which preoccupies our hearing / brain, till it is answered. There too does the perception of music follow the abilities we need to survive. Imagine we would see a snake in the corner of this room, lying there calm and rolled up. Our attention would be immediately caught: Is it sleeping? Is it dead? Is it artificial, made from plastic? As long as these questions are not clearly answered, we are completely occupied by this. As soon as we see that it is artificial, it is no longer interesting for us. If it is real, but dead, we become preoccupied with the problem of its disposal. If it is alive, there are a lot of further questions: Is it dangerous? What is to do? Shall we leave the room? Tell the doorman? Call for the police? The fire brigade?

The same processes develop when we listen to the first notes of the children's tune mentioned at the beginning: After the 3rd note, at the latest, the brain asks itself whether the next note will come after the same time-distance as the notes before and whether the upward-movement will be pursued in the same interval. Each new tone brings new information, which is immediately compared with the information before it, but not only with the tones themselves, that we have heard already, but also with the field of information, which they bring in addition, in our case the C-major key and the meter and periodicity, which results from the 4/4 meter.

It is the amount of information that matters. If we have the series of figures 1-1-1-1-1- etc., we only find one piece of information: figure one is followed by figure one. As soon as we have realized this information, we are no longer interested in this series. If we have an accidental series like 3-5-2-8-5-6-9-1-7- etc., we get a new piece of information with each figure, seemingly too much information, but in the end no gain in information, because the only relevant information is: after some figure there comes another figure. It is different, if we have this series: 1-2-3-2-3-4-3-4-5. The brain realizes a pattern and goes further: will now 4-5-6 come or will the pattern be broken? Our perception runs between those two poles – too little information to seem relevant for us or too much of permanent new information for us to work it out, that is to say, to connect it with the former information. One will find examples for music close to zero in the area of minimal music, examples for permanent over-information occasionally in the avant-garde of the 20th century.

With two well known, very different compositions of the 20th century I want to explain the functioning of this processing of information, this creating of connections, which awakes in the listener the feeling of a phrase, an arch, perhaps even a big arch.

At first a piece of atonal, ametric music, the beginning of Lutoslawski´s *String Quartet* (1964, Introductory Movement):

Example 3: Witold Lutoslawski, *Cvartetul pentru coarde,* p. 1

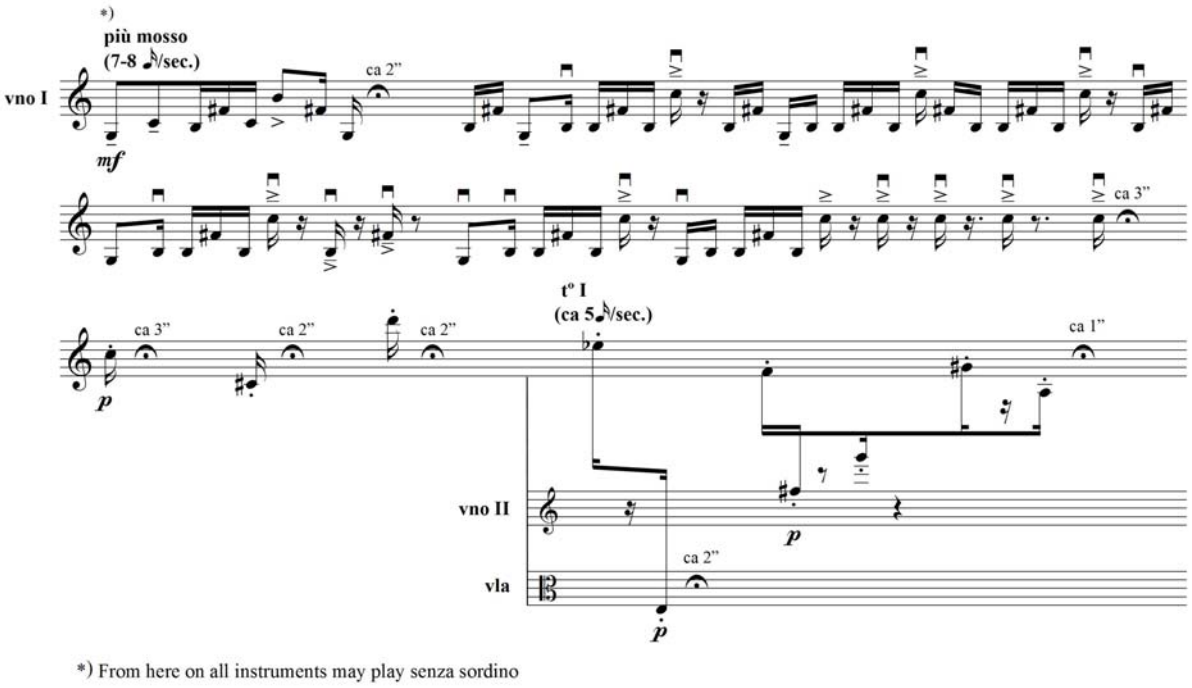
The 1st violin starts pp with a single short tone, repeats it after a pause of about 2 sec., after another pause of about 1 sec. there comes a new tone, one semitone higher, produced exactly like the tones before (short, pp). Those three tones are repeated (as long as the audience is silent), after that there comes another new tone, again one semitone higher than the note before, though in addition to this one octave higher; still short and pp like before. After this again a new tone, again one semitone higher, again short and soft, this time p instead of pp. Thereafter three notes shortly one after the other, in the known interval of the minor 2^{nd}, though this time down instead of up and distanced from the note before it by a new interval, the tritone. The same dynamics (p), though with a little *cresc*. and *decresc*.; the same articulation (short), though combined with the *portato* of the middle note. One can see that each new information (new pitch / new group of notes) is connected to the repetition of something that has been already presented (articulation, dynamic, interval).

A successive widening takes place in this way, the new permanently combined with the old: The next note (d-flat) is a new pitch indeed, again with the same dynamics and articulation, and with a further minor 2^{nd} lower than the note before. After this a group of three notes: again semitones (preceded by the minor 9^{th} = minor 2^{nd} + octave, as before), again the *staccato-portato* combination, still soft etc. until the end of the second line. Indeed new, as a contrast, is the third line: suddenly a group of 34 notes rapidly succeeding one another with new articulation (*legato* over groups of two or three notes). But there is a lot that stays just as before: little groups of two or three notes, still soft, still solo violin playing, still (with just an exception) always minor 2^{nd} up and down, sometimes an octave lower or higher (therefore minor 9^{th}, major 7^{th}); the one exception is a tritone leap, an interval that has also occured before already.

Example 4: Witold Lutoslawski, *Cvartetul pentru coarde,* p. 2

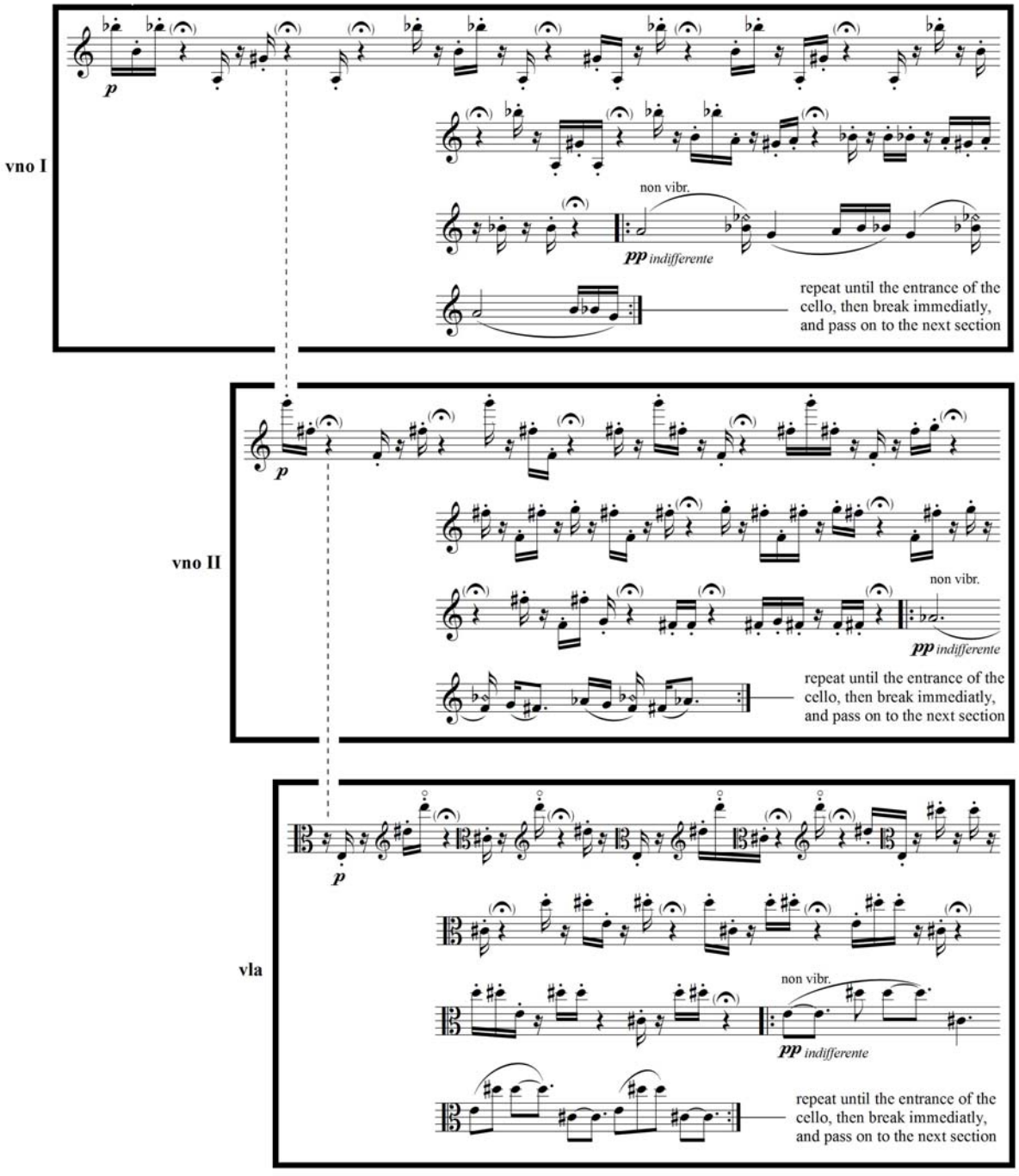
The next page (ex. 3/page 2) shows the same principle: something new is always combined with something already known. New: three instruments (2nd violin, viola, cello) are playing together at the same time, and longer notes are sounding. Already known: small intervals (even quarter-tones), sometimes a tritone, still soft (p with little *cresc*., *decresc*.), 2- and 3-note-groups, always with a p *staccato* note at the beginning.

Example 5: Witold Lutoslawski, *Cvartetul pentru coarde,* p. 3



Again first violin solo, new gestures and dynamics (lively, mf), new intervals (perfect 4th, perfect 5th, major 3rd), but also the former intervals major 7th and minor 9th, groups of notes (6, 8 and 14 notes), then single notes p *staccato* again, and at the end of he page intervals of major 7th minor 9th, sometimes with an octave inbetween, spread over three instruments (1st violin, 2nd violin, viola).

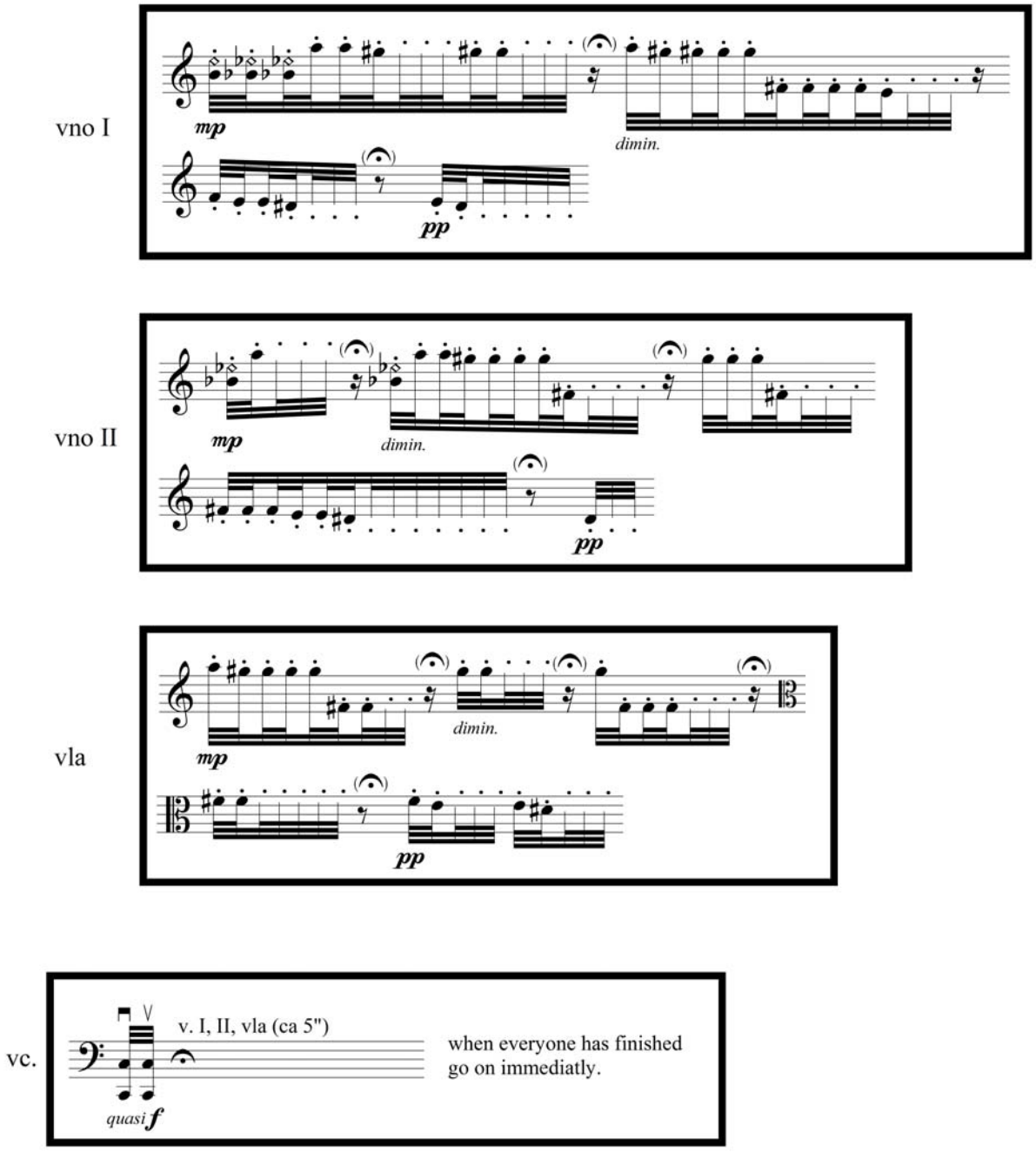
Example 6: Witold Lutoslawski, *Cvartetul pentru coarde,* p. 4


vno I
p
non vibr.
pp indifferente
repeat until the entrance of the cello, then break immediatly, and pass on to the next section
vno II
p
non vibr.
pp indifferente
repeat until the entrance of the cello, then break immediatly, and pass on to the next section
vla
p
non vibr.
pp indifferente
repeat until the entrance of the cello, then break immediatly, and pass on to the next section

Thus this successive widening finds its permanent continuation. Page 4: single *staccato*-tones and small groups, spread over three instruments (1st violin, 2nd violin, viola) with the known intervals major 7th and minor 9th followed by legato-lines with minor.seconds

and major sevenths, new intervals are introduced unobtrusively: major 2nd major 9th, minor.3rd.

Example 7: Witold Lutoslawski, *Cvartetul pentru coarde,* p. 5



Page 5: fast staccato-groups with tone-repetitions, minor seconds, minor ninthhs, but also major seconds, major ninths, and then a real surprise: the *subito quasi forte* octave of the cello, which is taken over by the other instruments at page 6:

Example 8: Witold Lutoslawski, *Cvartetul pentru coarde,* p. 6

The interval (octave) as well as the dynamics are new here, the formation of small groups, the principle of repetition within a small space and the general pauses are familiar. In reaction to this page 7: a confusion of pizziccato-tones. New: the performing technique, occasionally the new intervals minor 6th, major 6th, occasionally broken major and minor triads and seventh chords. Already known: groups of notes and single notes, short (*pizziccato* as an intensification of *staccato*) and soft.

Example 3: page 7

So each new page shows the technique of successive widening, the permanent connection of each new element to something already heard, until enough material is collected to start with the real piece (2nd part: Main Movement). A music perfectly created for our way of perceiving and processing what we have perceived.

For a second example the last movement from Messiaen´s *L' Ascension* (1932/33):

Example 9: Olivier Messiaen, *L' Ascension*, bar 36-63

10
1° Vons
5
2° Vons
Soli
5
Altos
Soli
2
Velles
Soli
ff
mf
f

20
1° Vons
5
2° Vons
Soli
5
Altos
Soli
2
Velles
Soli
V
> p
f > p
piu f > p

29
1° Vons
5
2° Vons
Soli
5
Altos
Soli
2
Velles
Soli
ff > p
fff
ff

Only strings, multiple *divisi*, throughout homophone. At the beginning a slow, chromatic, very dissonant upward movement (leaving out the notes c and f-sharp) with *crescendo* from p to ff, leading to a D-major with minor 7th-chord in the second inversion (including the notes c and f-sharp that were left out before). A long lingering in this harmony,

within it a slow melody in the violins, slow changes of harmony (including the notes e-flat, b-flat, a-flat, f), that do not detach themselves from the D-major chord. The same once more (from bar 9), this time more widely stretched (16 instead of 8 bars), then once again (from bar 25), interrupted after 4 bars and begun again (from bar 29), but this time one note higher, etc.: always the same, never exactly the same, once longer, once shorter, but always the same gesture, beginning with the chromatic upwardly directed (dissonant) quaver movement, leading to the same second inversion of D7. The only development met throughout: It gets higher and higher, eventually (bar 53) the quaver-figure starts finally one octave higher than at the very beginning, and the piece ends in the very highest range, with a D7 chord, endlessly held in fff in the second inversion.

During this movement which lasts, after all, 9 minutes, there is in fact no developing of the material, rather a perpetually lingering, possibly a deepening of it. Arches stretch from the first gesture of the beginning to each new, similar figure, and over all these single arches there stretches the big arch of the permanent rise, which is the idea of the piece, named in its title ("Prayer of Christ ascending to his father"). The challenge to the listener to combine what he hears in the moment with what he has heard before is quite an easy one, because one hears something always similar, even nearly the same, an aspect emphasized decades later in the minimal music. The economy in respect of obvious new-information from one moment to the next is compensated on the one hand by the pure beauty of the sound, in which one loves to linger for a while, and on the other hand it is precisely this economy that brings the opportunity to the listener to follow the process very consciously, to perceive it in detail. The inborn, acquired, survival-necessary abilities of our mind are thus not so much trained as rather pleased, comforted, and this too is a benefit.